

CHAU NGUYEN et al.  
Application No.: 09/190,961  
Page 4

PATENT

REMARKS

Claims 1-2, 4-9, and 11-30 are pending. Claims 1, 8, 20, and 24-26 have been amended. A copy of all pending claims, including those unchanged by this response, is attached for the Examiner's reference in the VERSION SHOWING CHANGES MADE.

Applicants thank the Examiner for the courtesy of the telephone conference held March 11, 2003. During that telephone conference, the Examiner indicated that all pending claims would be allowable if claim 20 was amended in the manner suggested. Claim 20 has now been amended to have the form recommended by the Examiner.

In a subsequent telephone conference of March 12, 2002, the Examiner confirmed the allowability of the claims, but indicated that the instant response should also include the amendments of the response previously filed on October 16, 2002, which was deemed nonconforming by the USPTO. Accordingly, these amendments are also included in this response. Finally, the Examiner indicated that the Terminal Disclaimer filed with the nonconforming response of October 16, 2002 had been accepted and entered.

In view of the foregoing, Applicants believe all claims now pending in this Application are in condition for allowance. The issuance of a formal Notice of Allowance at an early date is respectfully requested. If the Examiner believes a telephone conference would expedite prosecution of this application, please telephone the undersigned at 650-326-2400.

Respectfully submitted,



Kent J. Tobin  
Reg. No. 39,496

TOWNSEND and TOWNSEND and CREW LLP  
Tel: (650) 326-2400 / Fax: (415) 576-0300  
KJT:km

PA 3290709 v1

CHAU NGUYEN et al.  
Application No.: 09/190,961  
Page 5

PATENT

VERSION SHOWING CHANGES MADE

**In the Specification:**

The paragraph starting at page 2, line 20 has been revised as follows:

In another embodiment, a polyimide is used for a plug in an injection valve instead of prior art fluoropolymers. The polyimide, preferably [Vespel] VESPEL® (a Du Pont product) is used, and exhibits better tolerance to the liquid phosphorous precursor compound and heat. The polyimide can also be used for gaskets and seals.

The paragraph starting at page 4, line 18 has been revised as follows:

Plug 68 in existing valves is a compressible sealer typically made of [Kel-F] KEL-F® Du Pont fluoropolymer. We have found that [Kel-F] KEL-F® tends to swell up and break. Accordingly, another aspect of the present invention is the use of [Vespel] VESPEL® (DuPont polyimide resin) for the plug. [Vespel] VESPEL® can also be used for gaskets and seals in any system which utilizes a liquid phosphorous precursor compound.

The paragraph starting at page 4, line 23 has been revised as follows:

The valve also includes a shut-off plug 72 which can be lowered to close the orifice when flow is desired to be shut off. Plug 72 is also preferably made of [Vespel] VESPEL®. Also included are heater elements 74 which function to heat the valve to prevent condensation of the gaseous mixture. A thermal couple 76 allows monitoring of the temperature of the valve.

**In the Claims:**

1. (Three times Amended) An apparatus for use with a liquid phosphorous precursor compound comprising:
  - a container [comprising] containing a liquid phosphorous precursor compound;
  - a conduit; and
  - an orifice disposed between the liquid container and the conduit, wherein at least one of the liquid container, the orifice, and the conduit has a surface of a stainless steel alloy having less than about one percent (1%) nickel.

CHAU NGUYEN et al.  
Application No.: 09/190,961  
Page 6

PATENT

2. (Unchanged/Previously amended) The apparatus of claim 1 wherein said stainless steel alloy has at least 15% chromium.

4. (Unchanged/Previously amended) The apparatus of claim 1 wherein said stainless steel alloy is selected from the group consisting of stainless steel alloy 430, stainless steel alloy 440, and stainless steel alloy 446.

5. (Unchanged/Previously amended) The apparatus of claim 1 wherein said liquid phosphorous precursor compound comprises TEPO.

6. (Unchanged/Previously amended) The apparatus of claim 1 wherein said liquid phosphorous precursor compound comprises TMP.

7. (Unchanged/Previously amended) The apparatus of claim 1 wherein said liquid phosphorous precursor compound comprises TEP.

8. (Three times amended) An apparatus for delivering a liquid phosphorous precursor compound, comprising:

a container [comprising] containing a liquid phosphorous precursor compound;

a conduit configured to convey said liquid phosphorous precursor compound or a gaseous product of said liquid phosphorous precursor compound from the container;

a heating surface coupled to at least one of a portion of said container and a portion of said conduit;

wherein at least one of said portion of said container and said portion of said conduit is composed of a stainless steel alloy having less than about one percent (1%) nickel.

9. (Unchanged/Previously amended) The apparatus of claim 8 wherein said stainless steel alloy comprises at least 15% chromium.

11. (Unchanged/Previously amended) The apparatus of claim 8 wherein said stainless steel alloy is selected from the group consisting of stainless steel alloy 430, stainless steel alloy 440, and stainless steel alloy 446.

CHAU NGUYEN et al.  
Application No.: 09/190,961  
Page 7

PATENT

12. (Unchanged/Previously amended) The apparatus of claim 8 further comprising a heater for heating said heating surface to a temperature of between about 160-170 degrees Celsius.

13. (Unchanged) The apparatus of claim 8 wherein said apparatus is a bubbler system for delivering gases to a chemical reaction chamber for semiconductor wafers.

14. (Unchanged) The apparatus of claim 8 wherein said apparatus is a boiler system for delivering gases to a chemical reaction chamber for semiconductor wafers.

15. (Unchanged/Previously amended) The apparatus of claim 8 wherein said apparatus comprises an injection system for delivering gases to a chemical reaction chamber for semiconductor wafer fabrication, and wherein said injection system includes an injection valve composed of a stainless steel alloy having less than 5 percent nickel.

16. (Previously amended) The apparatus of claim 8 wherein said portion composed of the stainless steel alloy comprises a gasket and a seal.

17. (Previously amended) The apparatus of claim 8 wherein said liquid phosphorous precursor compound comprises TEPO.

18. (Previously amended) The apparatus of claim 8 wherein said liquid phosphorous precursor compound comprises TMP.

19. (Previously amended) The apparatus of claim 8 wherein said liquid phosphorous precursor compound comprises TEP.

20. (Three Times Amended) A liquid flow injection valve for supplying TEPO, TMP or TEP to a chemical vapor deposition (CVD) chamber comprising:  
an injection orifice [for connecting] connected to a source [of] containing liquid TEPO, TMP or TEP; and  
a valve outlet for delivering a gaseous mixture generated from said liquid TEPO, TMP or TEP to said CVD chamber;

CHAU NGUYEN et al.  
Application No.: 09/190,961  
Page 8

PATENT

said injection orifice including a stainless steel alloy having less than about one percent (1%) nickel.

21. (Unchanged/Previously amended) The valve of claim 20 wherein said stainless steel alloy has at least 15% chromium.

22. (Unchanged/Previously amended) The valve of claim 20 wherein said stainless steel alloy is selected from the group consisting of stainless steel alloy 430, stainless steel alloy 440, and stainless steel alloy 446.

23. (Unchanged/Previously amended) The valve of claim 20 further comprising a heater for heating said valve to a temperature of between about 160-170 degrees Celsius.

24. (Amended) The valve of claim 20 further comprising a plug in said valve composed of a [polyamide] polyimide.

25. (Amended) The valve of claim 24 wherein said [polyamide] polyimide is [Vespe] VESPEL®.

26. (Three times amended) A liquid injection system for a CVD chamber comprising:

a container [comprising] containing a liquid TEPO, TMP or TEP;

an injection valve for converting said liquid TEPO, TMP or TEP into gaseous form, said injection valve having portions in contact with said liquid TEPO, TMP or TEP composed of a stainless steel alloy having less than about one percent (1%) nickel and at least 15% chromium;

a liquid TEPO, TMP or TEP injection line coupling said container to said injection valve;

a carrier gas source line coupled to said injection valve; and

an outlet line coupling said injection valve to said CVD chamber.

CHAU NGUYEN et al.  
Application No.: 09/190,961  
Page 9

PATENT

27. (Unchanged/Previously amended) The system of claim 26 wherein said stainless steel alloy is selected from the group consisting of stainless steel alloy 430, stainless steel alloy 440, and stainless steel alloy 446.

28. (Unchanged/Previously Amended) A method for injecting gaseous phosphorous precursor into a chemical vapor deposition chamber, the method comprising:  
providing a liquid TEPO, TMP or TEP through an injection valve including a stainless steel alloy having less than about one percent (1%) nickel;  
providing a carrier gas through said valve;  
creating a pressure differential in said valve; and  
heating said injection valve.

29. (Unchanged/Previously amended) The method of claim 28 further comprising the step of heating said valve to a temperature of between about 160-170 degrees Celsius.

30. (Unchanged) The method of claim 29 wherein said valve is heated to approximately 165 degrees Celsius.